



**United States Department of Commerce**  
National Institute of Standards and Technology

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## *NIST Special Publication 814*

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# *Interpretation of the SI for the United States and Metric Conversion Policy for Federal Agencies*

*Barry N. Taylor, Editor*

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U.S. DEPARTMENT OF COMMERCE

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# *Interpretation of the SI for the United States and Metric Conversion Policy for Federal Agencies*

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Barry N. Taylor, Editor

Physics Laboratory  
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and Technology  
Gaithersburg, MD 20899

October 1991



U.S. Department of Commerce  
Robert A. Mosbacher, Secretary

National Institute of Standards and Technology  
John W. Lyons, Director

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## **Introduction**

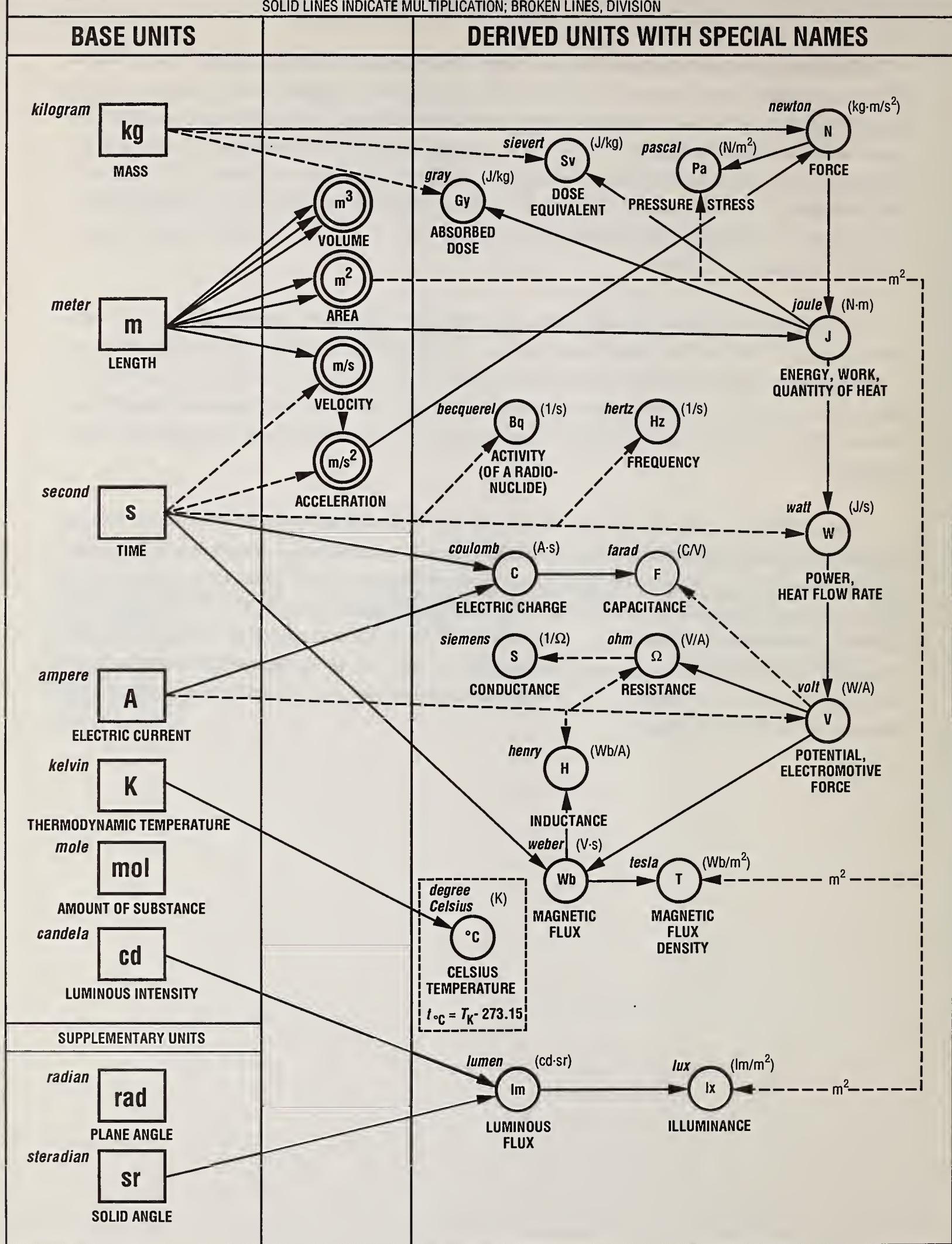
This National Institute of Standards and Technology (NIST) Special Publication replaces National Bureau of Standards (NBS) Letter Circular LC1132 published April 19, 1982. It reprints the Department of Commerce, NIST, Federal Register notice of December 20, 1990 titled "Metric System of Measurement; Interpretation of the International System of Units for the United States" (the International System of Units, abbreviated SI, is the modernized metric system); the Department of Commerce, Office of the Secretary, Federal Register notice of January 2, 1991 titled "Metric Conversion Policy for Federal Agencies"; and Executive Order 12770 issued by the President of the United States on July 25, 1991 titled "Metric Usage in Federal Government Programs."

The first Federal Register notice restates the Department of Commerce's interpretation of the International System of Units for the United States that was last published by the Department in 1982; the second revises the Code of Federal Regulations (CFR) to remove the voluntary aspect of the conversion to the metric system of measurement for Federal agencies; and the Executive Order provides Presidential authority and direction for the use of the metric system of measurement by Federal departments and agencies in their programs.

A more detailed description of the International System of Units or SI, the modernized metric system, than is presented in the first Federal Register notice is given in National Institute of Standards and Technology Special Publication (SP) 330 titled *The International System of Units (SI)*, 1991 Edition, Barry N. Taylor, USA Editor. This publication may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402. The 1991 edition of SP 330 is the USA edition of the English language translation of the sixth edition of *Le Système International d'Unités (SI)*, the definitive reference on the foundation and fundamental principles of the SI published in 1991 by the International Bureau of Weights and Measures in the French language.

# RELATIONSHIPS OF SI UNITS

SOLID LINES INDICATE MULTIPLICATION; BROKEN LINES, DIVISION



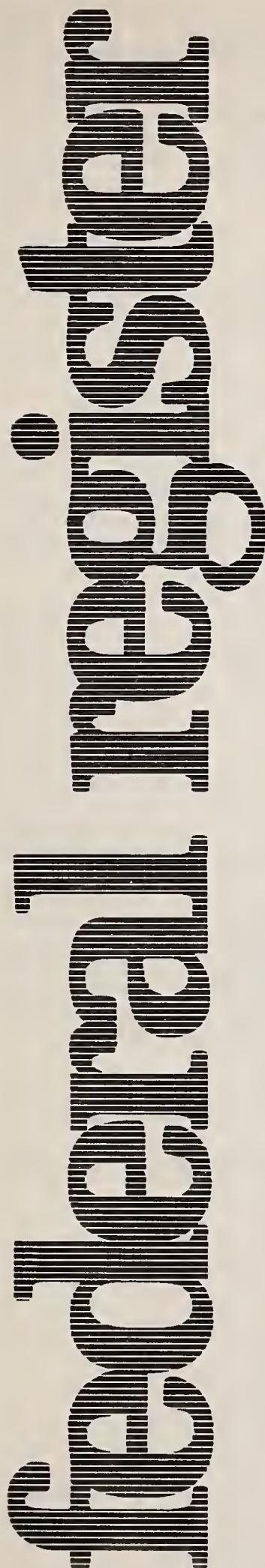
The diagram at the left shows graphically how the 19 SI derived units with special names listed in Table 3 of the following Federal Register Notice are derived in a coherent manner from the base and supplementary units. In the first column the symbols of the base and supplementary units are shown in rectangles, with the name of the unit shown toward the upper left of the rectangle in italic type and the name of the quantity (measurable attribute) shown below the rectangle. In the third column the symbols of the derived units with special names are shown in solid circles, with the name of the unit shown toward the upper left of the circle in italic type, the name of the quantity shown below the circle, and an expression of the derived unit in terms of other units shown toward the upper right in parenthesis. In the second column are shown those derived units without special names that are used in the derivation of the derived units with special names [the cubic meter ( $m^3$ ) excepted]. In the diagram the derivation of each unit is indicated by arrows bringing in numerator factors (solid lines) and denominator factors (broken lines).

The unit "degree Celsius," which is equal to the unit "kelvin" and is shown in the diagram in a broken-line rectangle, is used to express Celsius temperature. In this case, "degree Celsius" is a special name used in place of "kelvin." This equality is indicated in the diagram by the symbol K in parenthesis toward the upper right of the  $^{\circ}\text{C}$  circle. The equation below "CELSIUS TEMPERATURE" relates Celsius temperature ( $t^{\circ}\text{C}$ ) to thermodynamic temperature ( $T_K$ ). An interval or difference of Celsius temperature can, however, be expressed in kelvins as well as in degrees Celsius.



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**Thursday**  
**December 20, 1990**



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**Part II**

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**Department of  
Commerce**

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**National Institute of Standards and  
Technology**

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**Metric System of Measurement;  
Interpretation of the International System  
of Units for the United States; Notice**

**DEPARTMENT OF COMMERCE****National Institute of Standards and Technology**

[Docket No. 900663-0163]

**Metric System of Measurement; Interpretation of the International System of Units for the United States****AGENCY:** National Institute of Standards and Technology, Commerce.**ACTION:** Notice.

**SUMMARY:** This notice restates the interpretation of the Department of Commerce as to the International System of Units ("SI") for the United States. This interpretation was last published by the Department of Commerce in the **Federal Register** on February 26, 1982 (47 FR 8399-8400). Although the contents of the tables have not been changed in any significant way since 1982, in view of the amendment of the Metric Conversion Act of 1975 by the Omnibus Trade and Competitiveness Act of 1988, and because over eight years have elapsed since the above **Federal Register** notice was published, it is deemed appropriate to once again issue tables and associated text setting forth the interpretation of the SI for the United States.

**FOR FURTHER INFORMATION CONTACT:**

For information regarding the International System of Units, Dr. Barry N. Taylor, Building 221, Room B160, National Institute of Standards and Technology, Gaithersburg, Maryland 20899, telephone number (301) 975-4220. For more information regarding the

Federal Government's program for use of the International System of Units, Mr. James B. McCracken, Metric Program Office, U.S. Department of Commerce, Washington, DC 20230, telephone (202) 377-0944.

**SUPPLEMENTARY INFORMATION:** Section 5164 of Public Law 100-418, the Omnibus Trade and Competitiveness Act of 1988, amends Public Law 94-168, the Metric Conversion Act of 1975. In particular, section 3 of the latter act is amended to read as follows:

"Sec. 3. It is therefore the declared policy of the United States—

"(1) to designate the metric system of measurement as the preferred system of weights and measures for United States trade and commerce;

"(2) to require that each Federal agency, by a date certain and to the extent economically feasible by the end of the fiscal year 1992, use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms, such as when foreign competitors are producing competing products in non-metric units;

"(3) to seek ways to increase understanding of the metric system of measurement through educational information and guidance and in Government publications; and

"(4) to permit the continued use of traditional systems of weights and measures in nonbusiness activities."

Section 403 of Public Law 93-380, the Education Amendments of 1974, states that it is the policy of the United States to encourage educational agencies and institutions to prepare students to use the metric system of measurement as

part of the regular education program. Under both this act and the Metric Conversion Act of 1975, the "metric system of measurement" is defined as the International System of Units as established in 1960 by the General Conference on Weights and Measures and interpreted or modified for the United States by the Secretary of Commerce (sec. 4(4), Pub. L. 94-168; sec. 403(a)(3), Pub. L. 93-380). The Secretary has delegated his authority under these subsections to the Director of the National Institute of Standards and Technology.

In implementation of this authority, tables and associated materials were published in the **Federal Register** of February 26, 1982 (47 FR 8399-8400), setting forth the interpretation and modification of the International System of Units (hereinafter "SI") for the United States.

Although the contents of the tables have not been changed in any significant way since 1982, in view of the amendment of the Metric Conversion Act of 1975 by the Omnibus Trade and Competitiveness Act of 1988, and because over eight years have elapsed since the above **Federal Register** notice was published, it is deemed appropriate to once again issue tables and associated text setting forth the interpretation of the SI for the United States.

The SI is constructed from seven base units for independent quantities plus two supplementary derived dimensionless units for the dimensionless derived quantities plane angle and solid angle, as listed in Tables 1a and 1b.

TABLE 1a.—SI BASE UNITS

Quantity	SI unit	
	Name	Symbol
length.....	meter.....	m
mass <sup>1</sup> .....	kilogram.....	kg
time.....	second.....	s
electric current.....	ampere.....	A
thermodynamic temperature.....	kelvin.....	K
amount of substance.....	mole.....	mol
luminous intensity.....	candela.....	cd

<sup>1</sup> "Weight" in common parlance is often used to mean "mass."

TABLE 1b.—SI SUPPLEMENTARY UNITS

Quantity	SI unit		
	Name	Symbol	Expression in terms of SI base units
plane angle.....	radian.....	rad.....	$m \cdot m^{-1} = 1$
solid angle.....	steradian .....	sr.....	$m^2 \cdot m^{-2} = 1$

Units for all other quantities are derived from these nine units. For example, in Table 2 are listed a number of SI derived units obtained from the base units in a coherent manner, which means, in brief, that they are expressed as products and quotients of the seven base units without numerical factors.

TABLE 2.—EXAMPLES OF SI DERIVED UNITS EXPRESSED IN TERMS OF BASE UNITS

Quantity	SI unit	
	Name	Symbol
area .....	square meter .....	$\text{m}^2$
volume .....	cubic meter .....	$\text{m}^3$
speed, velocity .....	meter per second .....	$\text{m}/\text{s}$
acceleration .....	meter per second squared .....	$\text{m}/\text{s}^2$
wave number .....	reciprocal meter .....	$\text{m}^{-1}$
density, mass density .....	kilogram per cubic meter .....	$\text{kg}/\text{m}^3$
specific volume .....	cubic meter per kilogram .....	$\text{m}^3/\text{kg}$
current density .....	ampere per square meter .....	$\text{A}/\text{m}^2$
magnetic field strength .....	ampere per meter .....	$\text{A}/\text{m}$
concentration (of amount of substance) .....	mole per cubic meter .....	$\text{mol}/\text{m}^3$
luminance .....	candela per square meter .....	$\text{cd}/\text{m}^2$

Certain derived units that have been given special names and symbols are listed in Table 3. They may themselves be used to express other derived units, as is shown in Table 4. All the derived units given in Tables 3 and 4 have been obtained from the base and supplementary units in the same coherent manner indicated above.

TABLE 3.—SI DERIVED UNITS WITH SPECIAL NAMES

Quantity	SI unit	
	Name	Symbol
frequency .....	hertz .....	Hz
force .....	newton .....	N
pressure, stress .....	pascal .....	Pa
energy, work, quantity of heat .....	joule .....	J
power, radiant flux .....	watt .....	W
electric charge, quantity of electricity .....	coulomb .....	C
electric potential, potential difference, electromotive force .....	volt .....	V
capacitance .....	farad .....	F
electric resistance .....	ohm .....	$\Omega$
electric conductance .....	siemens .....	S
magnetic flux .....	weber .....	Wb
magnetic flux density .....	tesla .....	T
inductance .....	henry .....	H
Celsius temperature <sup>1</sup> .....	degree Celsius .....	$^{\circ}\text{C}$
luminous flux .....	lumen .....	lm
illuminance .....	lux .....	lx
activity (of a radionuclide) .....	becquerel .....	Bq
absorbed dose, specific energy imparted, kerma, absorbed dose index .....	gray .....	Gy
dose equivalent, dose equivalent index .....	sievert .....	Sv

<sup>1</sup> In addition to the thermodynamic temperature (symbol  $T$ ) expressed in kelvins (see Table 1a), use is also made of Celsius temperature (symbol  $t$ ) defined by the equation

$$t = T - T_0$$

where  $T_0 = 273.15$  K by definition. To express Celsius temperature, the unit "degree Celsius" which is equal to the unit "kelvin" is used; in this case, "degree Celsius" is a special name used in place of "kelvin." An interval or difference of Celsius temperature can, however, be expressed in kelvins as well as in degrees Celsius.

TABLE 4.—EXAMPLES OF SI DERIVED UNITS EXPRESSED BY MEANS OF SPECIAL NAMES

Quantity	SI unit	
	Name	Symbol
dynamic viscosity.....	pascal second.....	Pa·s
moment of force.....	newton meter.....	N·m
surface tension.....	newton per meter.....	N/m
heat flux density, irradiance.....	watt per square meter.....	W/m <sup>2</sup>
heat capacity, entropy.....	joule per kelvin.....	J/K
specific heat capacity, specific entropy.....	joule per kilogram kelvin.....	J/(kg·K)
specific energy.....	joule per kilogram.....	J/kg
thermal conductivity.....	watt per meter kelvin.....	W/(m·K)
energy density.....	joule per cubic meter.....	J/m <sup>3</sup>
electric field strength.....	volt per meter.....	V/m
electric charge density.....	coulomb per cubic meter.....	C/m <sup>3</sup>
electric flux density.....	coulomb per square meter.....	C/m <sup>2</sup>
permittivity.....	farad per meter.....	F/m
permeability.....	henry per meter.....	H/m
molar energy.....	joule per mole.....	J/mol
molar entropy, molar heat capacity.....	joule per mole kelvin.....	J/(mol·K)
exposure ( $\chi$ and $\gamma$ rays).....	coulomb per kilogram.....	C/kg
absorbed dose rate.....	gray per second.....	Gy/s

The supplementary units of Table 1b may be used in the expression of derived units as for the lumen in Table 3. Some additional examples are given in Table 5.

TABLE 5.—EXAMPLES OF SI DERIVED UNITS FORMED BY USING SUPPLEMENTARY UNITS

Quantity	SI unit	
	Name	Symbol
angular velocity.....	radian per second.....	rad/s
angular acceleration.....	radian per second squared.....	rad/s <sup>2</sup>
radiant intensity.....	watt per steradian.....	W/sr
radiance.....	watt per square meter steradian .....	W/(m <sup>2</sup> ·sr)

Table 6 gives the 16 prefixes used to form multiples and submultiples of the SI units. It is important to note that the kilogram is the only SI unit with a prefix as part of its name and symbol. Because double prefixes may not be used, in the case of mass the prefixes of Table 6 are to be used with gram (symbol g) and not with kilogram (symbol kg).

TABLE 6.—SI PREFIXES

Factor	Prefix	Symbol
$10^{18}$ .....	exa.....	E
$10^{15}$ .....	petra.....	P
$10^{12}$ .....	tera.....	T
$10^9$ .....	giga.....	G
$10^6$ .....	mega.....	M
$10^3$ .....	kilo.....	k
$10^2$ .....	hecto.....	h
$10^1$ .....	deka.....	da
$10^{-1}$ .....	deci.....	d
$10^{-2}$ .....	centi.....	c
$10^{-3}$ .....	milli.....	m
$10^{-6}$ .....	micro.....	$\mu$
$10^{-9}$ .....	nano.....	n
$10^{-12}$ .....	pico.....	p
$10^{-15}$ .....	femto.....	f
$10^{-18}$ .....	atto.....	a

Certain units are not part of the SI, but are important and widely used. The

units in this category that are accepted for use in the United States with the

International System are listed in Table 7.

TABLE 7.—UNITS IN USE WITH THE INTERNATIONAL SYSTEM

Name	Symbol	Value in SI unit
minute (time).....	min.....	1 min=60 s
hour.....	h.....	1 h=60 min=3 600 s
day.....	d.....	1 d=24 h=86 400 s
degree (angle).....	°.....	1°=(π/180) rad
minute (angle).....	'.....	1'=(1/60)°=(π/10 800) rad
second (angle).....	".....	1" (1/60)'=(π/648 000) rad
*liter.....	L.....	1 L=1 dm <sup>3</sup> =10 <sup>-3</sup> m <sup>3</sup>
**metric ton.....	t.....	1 t=10 <sup>3</sup> kg
hectare (land area).....	ha.....	1 ha=1 hm <sup>2</sup> =10 <sup>4</sup> m <sup>2</sup>
***electronvolt.....	eV.....	1 eV=1.602 18×10 <sup>-19</sup> J, approximately
***unified atomic mass unit.....	u.....	1 u=1.660 54 × 10 <sup>-27</sup> kg, approximately

\* Both L and l are internationally accepted symbols for liter. Because "l" can easily be confused with the numeral "1," the symbol "L" is recommended for United States use.

\*\* In many countries, this unit is called "tonne."

\*\*\* The values of these units expressed in terms of SI units must be obtained by experiment, and are therefore not known exactly. The electronvolt is the kinetic energy acquired by an electron passing through a potential difference of 1 volt in vacuum. The unified atomic mass unit is equal to ( $\frac{1}{12}$ ) of the mass of the atom of the nuclide  $^{12}\text{C}$ .

In those fields where their usage is already well established, the use of the units in Table 8 for a limited time is accepted, subject to future review.

TABLE 8.—UNITS IN USE TEMPORARILY WITH THE INTERNATIONAL SYSTEM

nautical mile	barn	roentgen.
knot	bar	rad <sup>3</sup>
Ångström	gal <sup>2</sup>	rem <sup>4</sup>
are <sup>1</sup>	curie	

<sup>1</sup> Unit of land area.

<sup>2</sup> Unit of acceleration.

<sup>3</sup> Unit of absorbed dose.

<sup>4</sup> Unit of dose equivalent.

As stated in the 1982 notice, metric units, symbols, and terms that are not in accordance with the foregoing interpretation are no longer accepted for continued use in the United States with the International System of Units. Accordingly, the following units and terms listed in the table of metric units in section 2 of the Act of July 28, 1866 that legalized the metric system of weights and measures in the United States are no longer accepted for use in the United States:

myriameter

stere  
millier or tonneau  
quintal  
myriagram  
kilo (for kilogram).

Although there is no formal comment period, public comments are welcome on a continuing basis. Comments should be submitted to Dr. Barry N. Taylor at the above address.

John W. Lyons,  
*Director.*

[FR Doc. 90-21913 Filed 12-19-90; 8:45 am]  
BILLING CODE 3510-13-M

**Editor's Note:** At the suggestion of its Consultative Committee for Units, the International Committee for Weights and Measures adopted four new SI prefixes at its September 1990 meeting. These new prefixes were approved by the 19th General Conference on Weights and Measures in September-October 1991. Thus the new prefixes, which are given below, have become officially part of the SI and hence of Table 6.

Factor	Prefix	Symbol
10 <sup>24</sup>	yotta	Y
10 <sup>21</sup>	zetta	Z
10 <sup>-21</sup>	zepto	z
10 <sup>-24</sup>	yocto	y



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**Wednesday**  
**January 2, 1991**

**Editors Note:** In a Federal Register notice of August 20, 1991 (56 FR 41281-41283), 15 CFR Part 19 was redesignated 15 CFR 1170. The authority citation for Part 1170 is revised to read as follows:

**Authority:** 15 U.S.C. 1512 and 3710, 15 U.S.C. 205a *et seq.*, and DOO 10-17 and DOO 10-18.

The Table of Contents for Part 1170 reads as follows:

Sec.

- 1170.1 Purpose.
  - 1170.2 Definition.
  - 1170.3 General Policy.
  - 1170.4 Guidelines.
  - 1170.5 Recommendations for Agency Organizations.
  - 1170.6 Reporting Requirement.
  - 1170.7 through 1170.99 reserved.
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## **Part IV**

# **Department of Commerce**

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**Office of the Secretary**

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**15 CFR Part 19  
Metric Conversion Policy for Federal  
Agencies; Rule**

**DEPARTMENT OF COMMERCE****Office of the Secretary****15 CFR Part 19**

[Docket No. 90913-0259]

RIN 0692-AA07

**Metric Conversion Policy for Federal Agencies**

**AGENCY:** Office of the Secretary, Under Secretary for Technology, U.S. Department of Commerce.

**ACTION:** Final rule.

**SUMMARY:** 15 CFR part 19 subpart B sets out Federal Government policy on the voluntary use of the metric system of measurement by agencies, industry and the public. In conformance with the Omnibus Trade and Competitiveness Act of 1988 (Pub. L. 100-418, section 5164), we are revising that subpart to remove the voluntary aspect of metric transition for Federal agencies. The amended subpart B provides policy direction to assist Federal agencies in their transition to use of the metric system of measurement.

**EFFECTIVE DATE:** February 1, 1991.

**FOR FURTHER INFORMATION CONTACT:** A. S. Whelihan, Office of Metric Programs, Room 4845, U.S. Department of Commerce, Washington, DC 20230; Phone (202) 377-0944.

**SUPPLEMENTARY INFORMATION:****Background**

The Omnibus Trade and Competitiveness Act of 1988 (Pub. L. 100-418, section 5164) declares the metric system to be the "preferred measurement system for U.S. trade and commerce." Federal agencies are also now required to use the metric system in procurement, grants and other business-related activities, by a date certain and to the extent economically feasible by the end of fiscal year 1992, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms, such as when foreign competitors are producing competing products in non-metric units.

These declarations and the accompanying report of the Congressional conferees require this updating of the existing Federal policy document. The policy set out below was issued as a proposed rule: "Metric Conversion Policy for Federal Agencies," 54 FR 41848, October 12, 1989, which updated the policy stated in a prior notice: "Metric Conversion Policy for Federal Agencies," 50 FR 27577, July 5, 1985. The updated policy

has been taken directly from the 1985 notice. However, this rule amends the earlier policy to bring the references and text up-to-date. The policy clarifies and strengthens Federal program requirements. Implementing agency initiatives are expected.

The current text reflects comments received from the public (1 comment) as well as from the Federal Metrication Operating Committee (MOC.) The text of the policy has been approved by the Federal Interagency Council on Metric Policy (ICMP.) Recommended changes from the representatives of the ICMP/MOC included updating the **Federal Register** notice defining the "metric system," clarifying the term "other business-related activities," and adding agency reporting requirements. These changes were made and are incorporated in the rule.

The only private sector response was from the American Petroleum Institute (API.) The API commented on: (1) Section 19.23(a), encouraging DoC to continue to coordinate federal agency metrication activities. That section was modified in the final, although it never mentioned DoC. However 19.22(a) refers to the Department's coordination role; (2) section 19.23(b), asking for a clarification of "areas where metrication is dependent on agency initiatives." That language was clarified and became § 19.23(c); and (3) section 19.23(d) pointing out that the American National Metric Council and the U.S. Metric Association are good sources for agencies seeking information on private sector metrication efforts. Section 19.24(d) recommends that agencies "maintain liaison with private sector groups (such as the American National Metric Council and the U.S. Metric Association) that are involved in planning for or coordinating National transition to the metric system."

**Rulemaking Requirement**

Under Executive Order 12291 the Department must judge whether a regulation is major within the meaning of section 1 of the Order and, therefore, subject to the requirement that a Regulatory Impact Analysis be prepared. This policy statement is not a major rule because it is not likely to result in (1) an annual effect on the economy of \$100,000,000 or more; (2) a major increase in costs or prices for consumers, individual industries, Federal, state or local government agencies, or geographic regions; or (3) significant adverse effects on competition, employment, investment, productivity, innovation, or in the ability of United States-based enterprises to compete with foreign-based enterprises

in domestic or export markets. Therefore, a Regulatory Impact Analysis will not be prepared.

This policy statement contains no policies with Federalism implications sufficient to warrant preparation of a Federalism assessment under Executive Order 12612.

This action is exempt from the analysis requirements of the Regulatory Flexibility Act because notice and opportunity for comment are not required for this policy statement by section 553 of the Administrative Procedure Act or any other law. Therefore, no initial or final regulatory flexibility analysis was prepared.

This policy statement does not contain a collection of information for purposes of the Paperwork Reduction Act.

**List of Subjects in 15 CFR Part 19**

Science and technology, Metric system.

For the reasons set out in the preamble part 19 of title 15 of the Code of Federal Regulations is amended as follows:

1. The authority citation for 15 CFR part 19 is revised to read as follows:

**Authority:** 15 U.S.C. 1512 and 3710, 15 U.S.C. 205a *et seq.* and DOD 10-17.

2. Subpart B is revised to read as follows:

**Subpart B—Metric Conversion Policy for Federal Agencies**

Sec.

- 19.20 Purpose.
- 19.21 Definition.
- 19.22 General Policy.
- 19.23 Guidelines.
- 19.24 Recommendations for Agency Organizations.
- 19.25 Reporting Requirement.
- 19.26 thru 19.199 reserved.

**Subpart B—Metric Conversion Policy for Federal Agencies****§ 19.20 Purpose.**

To provide policy direction for Federal agencies in their transition to use of the metric system of measurement.

**§ 19.21 Definition.**

**Metric system** means the International System of Units (SI) established by the General Conference of Weights and Measures in 1960, as interpreted or modified from time to time for the United States by the Secretary of Commerce under the authority of the Metric Conversion Act of 1975 and the Metric Education Act of 1978.

*Other business-related activities* means measurement sensitive commercial or business directed transactions or programs, i.e., standard or specification development, publications, or agency statements of general applicability and future effect designed to implement, interpret, or prescribe law or policy or describing the procedure or practice requirements of an agency. "Measurement sensitive" means the choice of measurement unit is a critical component of the activity, i.e., an agency rule/regulation to collect samples or measure something at specific distances or to specific depths, specifications requiring intake or discharge of a product to certain volumes or flow rates, guidelines for clearances between objects for safety, security or environmental purposes, etc.

#### § 19.22 General Policy.

The Omnibus Trade and Competitiveness Act of 1988 (Pub. L. 100-418, section 5164) amended the Metric Conversion Act of 1975 to, among other things, require that each Federal agency, by a date certain and to the extent economically feasible by the end of the fiscal year 1992, use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms, such as when foreign competitors are producing competing products in non-metric units.

(a) The Secretary of Commerce will appoint a Commerce Department Under Secretary to assist in coordinating the efforts of Federal agencies in meeting their obligations under the Metric Conversion Act, as amended.

(b) Federal agencies shall coordinate and plan for the use of the metric system in their procurements, grants and other business-related activities consistent with the requirements of the Metric Conversion Act, as amended. Federal agencies shall encourage and support an environment which will facilitate the transition process. When taking initiatives, they shall give due consideration to known effects of their actions on State and local governments and the private sector, paying particular attention to effects on small business.

(c) Each Federal agency shall be responsible for developing plans, establishing necessary organizational

structure, and allocating appropriate resources to carry out this policy.

#### § 19.23 Guidelines.

Each agency shall:

(a) Establish plans and dates for use of the metric system in procurements, grants and other business-related activities;

(b) Coordinate metric transition plans with other Federal agencies, State and local governments and the private sector;

(c) Require maximum practical use of metric in areas where Federal procurement and activity represents a predominant influence on industry standards (e.g.: weapon systems or space exploration). Strongly encourage metrification in industry standards where Federal procurement and activity is not the predominant influence, consistent with the legal status of the metric system as *the preferred system of weights and measures for United States trade and commerce*;

(d) Assist in resolving metric-related problems brought to the attention of the agency that are associated with agency actions, activities or programs undertaken in compliance with these guidelines or other laws or regulations;

(e) Identify measurement-sensitive agency policies and procedures and ensure that regulations, standards, specifications, procurement policies and appropriate legislative proposals are updated to remove barriers to transition to the metric system;

(f) Consider cost effects of metric use in setting agency policies, programs and actions and determine criteria for the assessment of their economic feasibility. Such criteria should appropriately weigh both agency costs and national economic benefits related to changing to the use of metric;

(g) Provide for full public involvement and timely information about significant metrification policies, programs and actions;

(h) Seek out ways to increase understanding of the metric system of measurement through educational information and guidance and in agency publications;

(i) Consider, particularly, the effects of agency metric policies and practices on small business; and

(j) Consistent with the Federal Acquisition Regulation System (48 CFR), accept, without prejudice, products and services dimensioned in metric when

they are offered at competitive prices and meet the needs of the Government, and ensure that acquisition planning considers metric requirements.

#### § 19.24 Recommendations for Agency Organization.

Each agency shall:

(a) Participate, as appropriate, in the Interagency Council on Metric Policy (ICMP), and/or its working committee, the Metrification Operating Committee (MOC), in coordinating and providing policy guidance for the U.S. Government's transition to use of the metric system.

(b) Designate a senior policy official to be responsible for agency metric policy and to represent the agency on the ICMP.

(c) Designate an appropriate official to represent the agency on the Metrification Operating Committee (MOC), an interagency committee reporting to the ICMP.

(d) Maintain liaison with private sector groups (such as the American National Metric Council and the U.S. Metric Association) that are involved in planning for or coordinating National transition to the metric system.

(e) Provide for internal guidelines, training and documentation to assure employee awareness and understanding of agency metric policies and programs.

#### § 19.25 Reporting Requirement.

Each Federal agency shall, as part of its annual budget submission each fiscal year, report to the Congress on the metric implementation actions it has taken during the previous fiscal year. The report will include the agency's implementation plans, with a current timetable for the agency's transition to the metric system, as well as actions planned for the budget year involved to implement fully the metric system, in accordance with this policy. Reporting shall cease for an agency in the fiscal year after it has fully implemented metric usage, as prescribed by the Metric Conversion Act (15 U.S.C. 205b(2).)

#### §§ 19.26 thru 19.199 [Reserved]

Dated: December 19, 1990.

Robert M. White,

Under Secretary for Technology.

[FR Doc. 90-30566 Filed 12-31-90; 8:45 am]

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## Presidential Documents

### Executive Order 12770 of July 25, 1991

#### Metric Usage in Federal Government Programs

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the Metric Conversion Act of 1975, Public Law 94-168 (15 U.S.C. 205a *et seq.*) ("the Metric Conversion Act"), as amended by section 5164 of the Omnibus Trade and Competitiveness Act of 1988, Public Law 100-418 ("the Trade and Competitiveness Act"), and in order to implement the congressional designation of the metric system of measurement as the preferred system of weights and measures for United States trade and commerce, it is hereby ordered as follows:

**Section 1. Coordination by the Department of Commerce.** (a) The Secretary of Commerce ("Secretary") is designated to direct and coordinate efforts by Federal departments and agencies to implement Government metric usage in accordance with section 3 of the Metric Conversion Act (15 U.S.C. 205b), as amended by section 5164(b) of the Trade and Competitiveness Act.

(b) In furtherance of his duties under this order, the Secretary is authorized:

(1) to charter an Interagency Council on Metric Policy ("ICMP"), which will assist the Secretary in coordinating Federal Government-wide implementation of this order. Conflicts and questions regarding implementation of this order shall be resolved by the ICMP. The Secretary may establish such subcommittees and subchairs within this Council as may be necessary to carry out the purposes of this order.

(2) to form such advisory committees representing other interests, including State and local governments and the business community, as may be necessary to achieve the maximum beneficial effects of this order; and

(3) to issue guidelines, to promulgate rules and regulations, and to take such actions as may be necessary to carry out the purposes of this order. Regulations promulgated by the Secretary shall function as policy guidelines for other agencies and departments.

(c) The Secretary shall report to the President annually regarding the progress made in implementing this order. The report shall include:

(1) an assessment of progress made by individual Federal agencies towards implementing the purposes underlying this order;

(2) an assessment of the effect that this order has had on achieving the national goal of establishing the metric system as the preferred system of weights and measures for United States trade and commerce; and

(3) on October 1, 1992, any recommendations which the Secretary may have for additional measures, including proposed legislation, needed to achieve the full economic benefits of metric usage.

**Sec. 2. Department and Agency Responsibilities.** All executive branch departments and agencies of the United States Government are directed to take all appropriate measures within their authority to carry out the provisions of this order. Consistent with this mission, the head of each executive department and agency shall:

(a) use, to the extent economically feasible by September 30, 1992, or by such other date or dates established by the department or agency in consultation with the Secretary of Commerce, the metric system of measurement in Federal Government procurements, grants, and other business-related activi-

ties. Other business-related activities include all use of measurement units in agency programs and functions related to trade, industry, and commerce.

(1) Metric usage shall not be required to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to United States firms.

(2) Heads of departments and agencies shall establish an effective process for a policy-level and program-level review of proposed exceptions to metric usage. Appropriate information about exceptions granted shall be included in the agency annual report along with recommendations for actions to enable future metric usage.

(b) seek out ways to increase understanding of the metric system of measurement through educational information and guidance and in Government publications. The transition to use of metric units in Government publications should be made as publications are revised on normal schedules or new publications are developed, or as metric publications are required in support of metric usage pursuant to paragraph (a) of this section.

(c) seek the appropriate aid, assistance, and cooperation of other affected parties, including other Federal, State, and local agencies and the private sector, in implementing this order. Appropriate use shall be made of governmental, trade, professional, and private sector metric coordinating groups to secure the maximum benefits of this order through proper communication among affected sectors.

(d) formulate metric transition plans for the department or agency which shall incorporate the requirements of the Metric Conversion Act and this order, and which shall be approved by the department or agency head and be in effect by November 30, 1991. Copies of approved plans shall be forwarded to the Secretary of Commerce. Such metric transition plans shall specify, among other things:

(1) the total scope of the metric transition task for that department or agency, including firm dates for all metric accomplishment milestones for the current and subsequent fiscal year;

(2) plans of the department or agency for specific initiatives to enhance cooperation with industry, especially small business, as it voluntarily converts to the metric system, and with all affected parties in undertaking the requirements of paragraph (a) of this section; and

(3) specific steps and associated schedules through which the department or agency will seek to increase understanding of the metric system through educational information and guidance, and in department or agency publications.

(e) designate a senior-level official as the Metric Executive for the department or agency to assist the head of each executive department or agency in implementing this order. The responsibilities of the Metric Executive shall include, but not be limited to:

(1) acting as the department's or agency's policy-level representative to the ICMP and as a liaison with other government agencies and private sector groups;

(2) management oversight of department or agency outreach and response to inquiries and questions from affected parties during the transition to metric system usage; and

(3) management oversight of preparation of the department's or agency's metric transition plans and progress reports, including the Annual Metric Report required by 15 U.S.C. 205j and OMB Circular A-11.

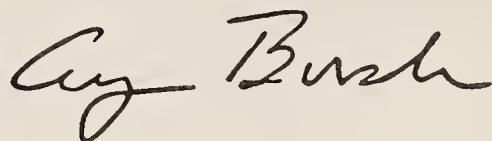
(4) preparation by June 30, 1992, of an assessment of agency progress and problems, together with recommendations for steps to assure successful implementation of the Metric Conversion Act. The assessment and recommendations shall be approved by the head of the department or agency and provided

to the Secretary by June 30, 1992, for inclusion in the Secretary's October 1, 1992, report on implementation of this order.

**Sec. 3. Application of Resources.** The head of each executive department and agency shall be responsible for implementing and applying the necessary resources to accomplish the goals set forth in the Metric Conversion Act and this order.

**Sec. 4. Judicial Review.** This order is intended only to improve the internal management of the executive branch and is not intended to create any right or benefit, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers, or any other person.

THE WHITE HOUSE,  
July 25, 1991.



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11. ABSTRACT (A 200-WORD OR LESS FACTUAL SUMMARY OF MOST SIGNIFICANT INFORMATION. IF DOCUMENT INCLUDES A SIGNIFICANT BIBLIOGRAPHY OR LITERATURE SURVEY, MENTION IT HERE.)  This National Institute of Standards and Technology (NIST) Special Publication replaces National Bureau of Standards (NBS) Letter Circular LC1132 published April 19, 1982. It reprints the Department of Commerce, NIST, Federal Register notice of December 20, 1990 titled "Metric System of Measurement; Interpretation of the International System of Units for the United States" (the International System of Units, abbreviated SI, is the modernized metric system); the Department of Commerce, Office of the Secretary, Federal Register notice of January 2, 1991 titled "Metric Conversion Policy for Federal Agencies"; and Executive Order 12770 issued by the President of the United States on July 25, 1991 titled "Metric Usage in Federal Government Programs." The first Federal Register notice restates the Department of Commerce's interpretation of the International System of Units for the Untied States that was last published by the Department in 1982; the second revises the Code of Federal Regulations (CFR) to remove the voluntary aspect of the conversion to the metric system of measurement for Federal agencies; and the Executive Order provides Presidential authority and direction for the use of the metric system of measurement by Federal departments and agencies in their programs. Also included is a diagram that shows graphically how the 19 SI derived units with special names are derived in a coherent manner from the SI base and supplementary units.	
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